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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/518,563	12/20/2004	Motoshi Kawamura	F-8489	8396
28107 7590 11/19/2007 JORDAN AND HAMBURG LLP 122 EAST 42ND STREET SUITE 4000 NEW YORK, NY 10168			EXAMINER PILKINGTON, JAMES	
			ART UNIT 3682	PAPER NUMBER
			MAIL DATE 11/19/2007	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/518,563	Applicant(s) KAWAMURA ET AL.	
	Examiner James Pilkington	Art Unit 3682	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 November 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) 4,6,7 and 11 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3,5,8-10 and 12 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>10/01/07</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. New claim 11 is withdrawn from consideration because it depends from withdrawn claim 4.

Claim Objections

2. Claim 1 is objected to because of the following informalities: line 6 the word "support" should be - - supporting - -. Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 3, 5, 8, 10 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jacob, DE19839481 (see US PGPub 2004/0173042 for English equivalent), in view of Yasuto, JP63167116.

Regarding claim 1, Jacob discloses a bearing apparatus for supporting a pinion shaft comprising:

- A case (1)
- A pinion shaft (5) having a pinion gear (4) at a first end and a companion flange (11) at a second end

- A pair of rolling bearings (16 and 17) which rotatably supporting the pinion shaft (5) to the case (1) and are arranged side by side in a shaft direction (along the shaft 5) between the pinion gear (4) and the companion flange (11)
- the rolling bearing (17) on the companion flange side (11) being an angular ball bearing comprising an inner ring (18) fixed to said pinion shaft (5), an outer ring (19) fixed to said case (1), and a set of balls (23) interposed between the inner and outer rings (18 and 19)
- said companion flange (11) applying a preload in an axial direction to said angular ball bearing (17) via the inner ring (18) (see paragraph 0021)
- said inner ring (18) having an inner raceway (near character 20 on the upper portion of Figure 2), the outer ring (19) having an outer race (near character 21 on the lower portion of Figure 2)
- the balls have a ball diameter

Jacob does not disclose a relationship between a radius of curvature R_i of the inner ring raceway, radius of curvature R_o of an outer ring raceway, and a ball diameter B_d of the rolling bearing that satisfies: $R_i < R_o$, $0.502B_d \leq R_i \leq 0.512B_d$ and $0.510B_d \leq R_o \leq 0.520B_d$.

Yasuto teaches a relationship between a radius of curvature R_i of the inner ring raceway, radius of curvature R_o of an outer ring raceway, and a ball diameter B_d (d) of the rolling bearing that satisfies: $R_i < R_o$, $0.502B_d \leq R_i \leq 0.512B_d$ and

$0.510Bd \leq Ro \leq 0.520Bd$. Yasuto explicitly discloses that Ri is between $0.501d$ and $0.509d$ and that Ro is between $0.501d$ and $0.519d$ which meets the limitation $Ri < Ro$.

All of the structural limitations are known in Jacob and Yasuto. The only difference is the combination of the "old elements" into a single device by mounting the particular bearing races to the pinion shaft of Jacob. Thus, it would have been obvious to one having ordinary skill in the art to mount the races taught by Yasuto onto the shaft of Jacob. The resulting combination would yield predictable results of preventing slippage of the ball bearings.

Regarding claim 3, Jacob discloses that the rolling bearing (17) on the companion flange side (11) includes a tandem type angular contact ball bearing with double raceway (see Figure 2).

Regarding claim 5, Jacob disclose that the rolling bearing (16) on the pinion side (4) of the pinion shaft (5) includes a tandem type angular contact ball bearing with double raceway (see Figure 2).

Regarding claims 8, 10 and 12, Yasuto discloses that the radius of curvature Ro is larger than the radius of curvature Ri by about 1% of the ball diameter (at the maximum values for Ro and Ri Yasuto discloses a differences of 0.01 which is 1%).

5. Claims 2 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jacob, DE19839481 (see US PGPub 2004/0173042 for English equivalent), in view of

Yasuto, JP63167116 as applied to claim 1 above and further in view of Eklund, USP 3,370,899.

Re clm 2, Jacob in view of Yasuto does not disclose a contact angle θ between the ball and the inner and outer ring raceways in the rolling bearing on the companion flange side satisfies $30 \leq \theta \leq 45$.

Eklund teaches a contact angle between the ball (14) and the inner and outer ring raceways (11 and 12) in a rolling bearing that satisfies $30 \leq \theta \leq 45$ (Eklund explicitly discloses two contact angles 36 and $37\frac{1}{2}$).

All of the structural limitations are known in Jacob, Yasuto and Eklund. The only difference is the combination of the "old elements" into a single device by adding contact angles in the range of $30 \leq \theta \leq 45$ in to the combination of Jacob in view of Yasuto. Thus, it would have been obvious to one having ordinary skill in the art to add contact angles within this range as taught by Yasuto onto the raceways of Jacob in view of Yasuto. The resulting combination would yield predictable results of preventing ball windup.

Regarding claim 9, Yasuto discloses that the radius of curvature R_o is larger than the radius of curvature R_i by about 1% of the ball diameter (at the maximum valves for R_o and R_i Yasuto discloses a differences of 0.01 which is 1%).

Response to Arguments

6. Applicant's arguments filed November 6, 2007 have been fully considered but they are not persuasive.

7. The Applicant argues that Jacob [Werner] in view of Yasuto does not disclose that the claimed curvatures and preload.

Jacob does indeed disclose that the inner ring of the bearing is subjected to a preload from the flange. Jacob states in paragraph 0021 of the English equivalent that the flange (thread piece 11) is tightened to shift the inner ring (18) to the right and creates a counterforce (preload) to be exerted between the inner ring and the flange.

Yasuto does indeed disclose the claimed curvature ranges. The Applicant admits on page 9 that Yasuto disclose an inner ring curvature of 50.1 and 51 percent of the ball diameter and an outer ring curvature of 50.1 and 52 percent of the ball diameter. In order for a reference to meet the limitations of a range the reference need only meet one of the points in the range. Since Yasuto teaches ranges that overlap there is at least one point which meets both range limitations.

8. The Applicant also notes that Yasuto reference is directed to a radial ball bearing and not an angular contact ball bearing.

Although the references may be directed toward different types of ball bearings Yasuto is teaching a radius of curvature of a raceway for the ball. Since both types of bearings use balls such a radius of curvature can be used in either type of bearing and result in a predictable result of a raceway which can support the ball. Therefore, the references are analogous because it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the

particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992).

9. The Applicant argues Eklund does not meet the claimed contact angle because Eklund discloses a different radius of curvature. In addition, the Applicant also argues that picking and choosing dimensions from a prior art reference does not make a case for obviousness.

First, the contact angle is not just determined by the radius of curvature at a given location but also the length of that arc segment. Second, Eklund is merely being looked at to show that such contact angles can be achieved at the given radius of 0.51. In the arguments the Applicant has chosen to look at only the maximum dimension disclosed in the Eklund reference and has ignored what the reference teaches as a whole. Eklund also shows a radius of curvature within the claimed range.

10. The Applicant's argues that in both Jacob in view of Yasuto and Jacob in view of Yasuto and further in view of Eklund the Examiner "has not set forth reasoning which would lead one skilled in the art" to the claimed invention (i.e. motivation).

As set forth above and in the prior office action, the Examiner sets forth that one of ordinary skill in the art would combined Jacob in view of Yasuto to provide the predictable result of preventing slippage in the ball bearing, this prevention of slippage stabilizes the assembly and prolongs the life of the bearing. Regarding Jacob in view

of Yasuto and further in view of Eklund, the Examiner sets forth that one would make such a combination to eliminate ball windup, this prevents the bearing from locking up.

11. Regarding the new claims 8, 9, 10 and 12, as noted above Yasuto does indeed disclose a difference of 1% between the radius of curvature R_o and R_i . At the maximum valves disclosed for both curvatures in Yasuto the difference is 1%.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James Pilkington whose telephone number is (571) 272-5052. The examiner can normally be reached on Monday-Friday 8:00AM-4:00PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Ridley can be reached on (571) 272-6917. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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11/14/07


Thomas R. Hannon
Primary Examiner